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| APPLICATION NO.                               | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/674,676                                    | 09/30/2003  | Marc A. Najork       | MSFT-2557/304882.01 | 4999             |
| 41505   | 7590        | 02/26/2009           | EXAMINER            |                  |
| WOODCOCK WASHBURN LLP (MICROSOFT CORPORATION) |             |                      | STACE, BRENT S      |                  |
| CIRA CENTRE, 12TH FLOOR                       |             |                      | ART UNIT            | PAPER NUMBER     |
| 2929 ARCH STREET                              |             |                      | 2161                |                  |
| PHILADELPHIA, PA 19104-2891                   |             |                      |                     |                  |
| MAIL DATE                                     |             | DELIVERY MODE        |                     |                  |
| 02/26/2009                                    |             | PAPER                |                     |                  |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                        |                     |  |
|------------------------------|------------------------|---------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b> | <b>Applicant(s)</b> |  |
|                              | 10/674,676             | NAJORK ET AL.       |  |
|                              | <b>Examiner</b>        | <b>Art Unit</b>     |  |
|                              | BRENT STACE            | 2161                |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 15 December 2008.  
 2a) This action is **FINAL**.                  2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1,2,4-6,9,10,12,14-16,19,20,22-27,29,30,32-34,37,38 and 40 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1,2,4-6,9,10,12,14-16,19,20,22-27,29,30,32-34,37,38 and 40 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on 30 June 2006 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ .                                    |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____.   | 6) <input type="checkbox"/> Other: _____ .                        |

## DETAILED ACTION

### **Remarks**

1. This communication is responsive to the amendment filed December 15<sup>th</sup>, 2008. Claims 1, 2, 4-6, 9, 10, 12, 14-16, 19, 20, 22-27, 29, 30, 32-34, 37, 38, and 40-56 are pending. In the amendment filed December 15<sup>th</sup>, 2008, Claims 1, 4-6, 9, 12, 14-16, 19, 22, 26, 29, 30, 32-34, 37, 38, 40-46, 50, 51, 53, and 55 are amended, Claims 3, 7, 8, 11, 13, 17, 18, 21, 28, 31, 35, 36, and 39 are canceled, and Claims 1, 12, 22, 29, 38, 46, 51, 53, and 55 are independent. The examiner acknowledges that no new matter was introduced. This action is made FINAL.

### **Response to Arguments**

The Applicant's remarks filed December 15<sup>th</sup>, 2008 with respect to Claims 1, 2, 4-6, 9, 10, 12, 14-16, 19, 20, 22-27, 29, 30, 32-34, 37, 38, and 40-56 have been fully considered but they are not persuasive. See below for a detailed response.

2. As to Applicant's arguments with respect to exemplary Claim 1 (including Claims 12, 22, 29, 38, 46, 51, 53, and 55) for the prior art(s) allegedly not disclosing "**generating a plurality of log entries corresponding to a plurality of data transactions associated with a single B-link tree operation**," the examiner respectfully disagrees. The claimed limitation that this argument appears to relate to is "**generating a plurality of log entries corresponding to a plurality of data transactions, the data transactions to be carried out on a plurality of nodes of a**

**B-link tree, wherein the data transactions are associated with a single B-link tree operation on said B-link tree."** First, in understanding the combination of the references (Lomet and Lehman) inherently in place, storage in Lomet is done as a B-link tree from Lehman (since, according to Lehman, B-link trees are favorable for database applications). Lomet, col. 1, lines 29-48 with Lomet, col. 22, lines 25-30 with Lomet, col. 19, lines 35-37 were used to reject these claimed limitations. In the cited sections, Lomet teaches first about transactions and that they include a series of records (or changes) to be done to a storage system (in Lomet's case, a data base). When the transaction is done (committed) all the changes are made persistent. If a crash occurs before a transaction is done, the system needs to be restored "to a state consistent with that produced by the last committed transactions." Therefore, all of the changes from the transaction(s) are either completed (committed) or fail (and subsequently restored). Lomet, col. 22, lines 25-30 teaches about how generated undo records are stored for each transaction. These undo log records are generated from the redo log records. This appears to teach the claimed limitation of "generating a plurality of log entries corresponding to a plurality of data transactions." Since the data of Lomet is in a B-link tree (as discussed above and below), when the transactions are carried out, they are carried out on a plurality of nodes of a B-link tree (e.g. root node, and children data nodes). These transactions are then at least associated with a single B-link tree operation on the B-link tree since, as stated above, the transactions (with at least a change) will be carried out a B-link tree and since the transaction is generally done atomically (Lomet teaches that all the effects are persistent when committed and

that Lomet is generally concerned with users having concurrent access to the data (see at least Lomet, col. 2, lines 17-28)).

3. As to Applicant's arguments with respect to exemplary Claim 1 (including Claims 12, 22, 29, 38, 46, 51, 53, and 55) for the prior art(s) allegedly not disclosing "**associating the log entries with each other for use in determining whether the single B-link tree operation has been completed**," the examiner respectfully disagrees. Including the discussion above, Lomet's log entries are associated with other log entries since the log entries are considered part of at least a transaction (a transaction includes many changes including log entries). The logs of Lomet are generally used for committing data, rolling back data, and undoing data. As such, they are used to determine whether the single B-link tree operation has been completed.

4. The other claims argued merely because of a dependency on a previously argued claim(s) in the arguments presented to the examiner, filed December 15<sup>th</sup>, 2008, are moot in view of the examiner's interpretation of the claims and art and are still considered rejected based on their respective rejections from at least a prior Office action (part(s) of recited again below).

### ***Specification***

5. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

***Claim Objections***

6. Claims 1, 12, 22, 29, 38, 46, 51, 53, and 55 are objected to because of the following informality:
  - a. All of the Claims 1, 12, 22, 29, 38, 46, 51, 53, and 55 recite the phrase "for use" (e.g. Claim 1, line 14). Intended use of the claimed invention or parts of the claimed invention carries little if any patentable weight.
- Appropriate correction measure(s) required.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1, 2, 4-6, 9, 10, 12, 14-16, 19, 20, 29, 30, 32-34, 37, 38, 40-45, and 51-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,485,608 (Lomet et al.) in view of “Efficient Locking for Concurrent Operations on B-Trees” (Lehman et al.).

For **Claim 1**, Lomet teaches: “A method for logging while updating...via a plurality of data transactions, [Lomet, col. 7, lines 26-34] comprising:

- generating a plurality of log entries corresponding to a plurality of data transactions, the data transactions to be carried out on a plurality of nodes of a B-link tree, wherein the data transactions are associated with a single B-link tree operation on said B-link tree, [Lomet, col. 1, lines 29-48 with Lomet, col. 22, lines 25-30 with Lomet, col. 19, lines 35-37] wherein said plurality of log entries include at least one entry from an allocation layer [Lomet, col. 1, lines 65-67 with Lomet, col. 5, lines 38-44] and at least one entry from a B-link tree layer, [Lomet, col. 19, lines 35-37 with Lomet, col. 5, lines 38-44] wherein said at least one entry from said allocation layer is local to its corresponding computing device of a plurality of computing devices [Lomet, col. 2, lines 50-53 with Lomet, col. 5, lines 51-62] and said at least one entry from said B-link tree is replicated among said plurality of computing devices; [Lomet, col. 2, lines 11-16]
- storing said plurality of log entries in a partially persistent log, wherein a tail of said partially persistent log is in a memory, and said partially persistent log comprises of said memory and a persistent storage; [Lomet, col. 4, lines 28-30

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with Lomet, col. 4, lines 64-67 with Lomet, col. 5, lines 1-3 with Lomet, col. 12, lines 20-23 with Lomet, col. 7, lines 26-34 with Lomet, col. 19, lines 35-37]

- associating said plurality of log entries with each other for use in determining whether the single B-link tree operation has been completed; [Lomet, col. 1, lines 29-48 with Lomet, col. 22, lines 25-30 with Lomet, col. 19, lines 35-37] and
- wherein a boundary between said memory and said persistent storage in said partially persistent log varies over time” [Lomet, col. 4, lines 28-30 with Lomet, col. 4, lines 64-67 with Lomet, col. 5, lines 1-3 with Lomet, col. 12, lines 20-23 with Lomet, col. 19, lines 35-37 with Lomet, col. 16, lines 23-25 see also Lomet, col. 19, lines 45-51 with Lomet, col. 20, lines 20-26].

Lomet discloses the above limitations but does not expressly teach:

- “...a B-link tree.”

With respect to Claim 1, an analogous art, Lehman, teaches:

- “...a B-link tree” [Lehman, p. 657, section 3.3].

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Lehman with Lomet because both inventions are directed towards storing information in a database.

Lehman's invention would have been expected to successfully work well with Lomet's invention because both inventions use databases. Lomet discloses methods and an apparatus for updating information in a computer system using logs and state identifiers comprising Rlogs, Ulogs and Alogs, however Lomet does not expressly

disclose the use of a B-link-tree to store the data in the database of Lomet. Lehman discloses efficient locking for concurrent operations on B-trees comprising a B-link-tree.

It would have been obvious to one of ordinary skill in the art at the time of invention to take the b-link-tree from Lehman and install it into the invention of Lomet, thereby offering the obvious advantage of a guaranteed small (average) search, insertion, and deletion time for the database of Lomet (see front page of Lehman).

**Claim 2** can be mapped to Lomet (as modified by Lehman) as follows: “A method according to claim 1, further including periodically truncating the log” [Lomet, cols. 11-12, lines 60-12].

**Claim 4** can be mapped to Lomet (as modified by Lehman) as follows: “A method according to claim 1, further including discarding one of the log entries from the log when the corresponding data transaction has been carried out on said B-link tree” [Lomet, col. 14, lines 9-12].

**Claim 5** can be mapped to Lomet (as modified by Lehman) as follows: “A method according to claim 1, wherein said storing includes storing said log entries into the log before the corresponding data transactions are carried out on said B-link tree” [Lomet, col. 7, lines 26-34].

**Claim 6** can be mapped to Lomet (as modified by Lehman) as follows: “A method according to claim 1, further including caching data of said data transactions before said data transactions are carried out on said B-link tree” [Lomet, col. 7, lines 26-34 with Lomet, col. 5, lines 1-11].

**Claim 9** can be mapped to Lomet (as modified by Lehman) as follows: “A method according to claim 1, further including maintaining a log sequence number with each of said plurality of log entries, uniquely identifying one of the log entries” [Lomet, col. 5, lines 44-52].

**Claim 10** encompasses substantially the same scope of the invention as that of Claim 1, in addition to computer readable medium and some instructions for performing the method steps of Claim 1. Therefore, Claim 10 is rejected for the same reasons as stated above with respect to Claim 1.

For **Claim 12**, Lomet teaches: “A method for logging while updating...via a plurality of data transactions, [Lomet, col. 7, lines 26-34] comprising:

- generating a plurality of log entries corresponding to a plurality of data transactions, the data transactions to be carried out on a plurality of nodes of a B-link tree, wherein the data transactions are associated with a single B-link operation on said B-link tree, [Lomet, col. 1, lines 29-48 with Lomet, col. 22, lines 25-30 with Lomet, col. 19, lines 35-37 with Lomet, col. 19, lines 45-51] wherein said plurality of log entries include at least one entry from an allocation layer [Lomet, col. 1, lines 65-67 with Lomet, col. 5, lines 38-44] and at least one entry from a B-link tree layer, [Lomet, col. 19, lines 35-37 with Lomet, col. 5, lines 38-44] wherein said at least one entry from said allocation layer is local to its corresponding computing device of a plurality of computing devices [Lomet, col. 2, lines 50-53 with Lomet, col. 5, lines 51-62] and said at least one entry from

said B-link tree is replicated among said plurality of computing devices; [Lomet, col. 2, lines 11-16]

- storing said plurality of log entries in a partially persistent log, wherein a tail of said partially persistent log is in a memory, and said partially persistent log comprises of said memory and a persistent storage; [Lomet, col. 4, lines 28-30 with Lomet, col. 4, lines 64-67 with Lomet, col. 5, lines 1-3 with Lomet, col. 12, lines 20-23 with Lomet, col. 7, lines 26-34 with Lomet, col. 19, lines 35-37]
- associating said plurality of log entries with each other for use in determining whether the single B-link operation has been completed; [Lomet, col. 1, lines 29-48 with Lomet, col. 22, lines 25-30 with Lomet, col. 19, lines 35-37 with Lomet, col. 19, lines 45-51] and
- wherein a boundary between said memory and said persistent storage in said partially persistent log varies over time [Lomet, col. 4, lines 28-30 with Lomet, col. 4, lines 64-67 with Lomet, col. 5, lines 1-3 with Lomet, col. 12, lines 20-23 with Lomet, col. 19, lines 35-37 with Lomet, col. 16, lines 23-25 see also Lomet, col. 19, lines 45-51 with Lomet, col. 20, lines 20-26]
- periodically flushing data corresponding to data transactions represented by the finite log to persistent storage; [Lomet, col. 14, lines 9-17] and
- truncating said finite log in coordination with said flushing” [Lomet, col. 14, lines 9-17].

Lomet discloses the above limitations but does not expressly teach:

- “a B-link tree.”

With respect to Claim 12, an analogous art, Lehman, teaches:

- “a B-link tree” [Lehman, p. 657, section 3.3].

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Lehman with Lomet because both inventions are directed towards storing information in a database.

Lehman’s invention would have been expected to successfully work well with Lomet’s invention because both inventions use databases. Lomet discloses methods and an apparatus for updating information in a computer system using logs and state identifiers comprising Rlogs, Ulogs and Alogs, however Lomet does not expressly disclose the use of a B-link-tree to store the data in the database of Lomet. Lehman discloses efficient locking for concurrent operations on B-trees comprising a B-link-tree.

It would have been obvious to one of ordinary skill in the art at the time of invention to take the b-link-tree from Lehman and install it into the invention of Lomet, thereby offering the obvious advantage of a guaranteed small (average) search, insertion, and deletion time for the database of Lomet.

**Claim 14** can be mapped to Lomet (as modified by Lehman) as follows: “A method according to claim 12, further including discarding one of the log entries from the finite log when the corresponding data transaction has been carried out on said B-link tree” [Lomet, col. 14, lines 9-17].

**Claim 15** can be mapped to Lomet (as modified by Lehman) as follows: “A method according to claim 12, wherein said storing includes storing said log entries into

the finite log before the corresponding data transactions are carried out on said B-link tree” [Lomet, col. 7, lines 26-34].

**Claim 16** can be mapped to Lomet (as modified by Lehman) as follows: “A method according to claim 12, further including caching data of said data transactions before said data transactions are carried out on said B-link tree” [Lomet, col. 7, lines 26-34 with Lomet, col. 5, lines 1-11].

**Claim 19** can be mapped to Lomet (as modified by Lehman) as follows: “A method according to claim 12, further including maintaining a log sequence number with each of said plurality of log entries, uniquely identifying one of the log entries” [Lomet, col. 5, lines 44-52].

**Claim 20** encompasses substantially the same scope of the invention as that of Claim 12, in addition to computer readable medium and some instructions for performing the method steps of Claim 12. Therefore, Claim 20 is rejected for the same reasons as stated above with respect to Claim 12.

**Claims 29 and 30** encompass substantially the same scope of the invention as that of Claims 1 and 2, respectfully, in addition to a server and some actions for performing the method steps of Claims 1 and 2, respectfully. Therefore, Claims 29 and 30 are rejected for the same reasons as stated above with respect to Claims 1 and 2, respectfully.

**Claims 32-34 and 37** encompass substantially the same scope of the invention as that of Claims 4-6 and 9, respectfully, in addition to a server and some actions for performing the method steps of Claims 4-6 and 9, respectfully. Therefore, Claims 32-34

and 37 are rejected for the same reasons as stated above with respect to Claims 4-6 and 9, respectfully.

**Claim 38** encompasses substantially the same scope of the invention as that of Claim 12, in addition to a server and some objects for performing the method steps of Claim 12. Therefore, Claim 38 is rejected for the same reasons as stated above with respect to Claim 12.

**Claims 40-42** encompass substantially the same scope of the invention as that of Claims 14-16, respectfully, in addition to a server and some objects for performing the method steps of Claims 14-16, respectfully. Therefore, Claims 40-42 are rejected for the same reasons as stated above with respect to Claims 14-16, respectfully.

**Claim 43** can be mapped to Lomet (as modified by Lehman) as follows: "A server according to claim 38, further including storing said plurality of log entries in an intermediate memory previous to storing said plurality of log entries in the finite storage log" [Lomet, col. 7, lines 26-34 with Lomet, col. 19, lines 35-37].

**Claim 44** can be mapped to Lomet (as modified by Lehman) as follows: "A server according to claim 43, wherein said plurality of log entries are moved from intermediate memory to the finite storage log after the data transactions commit" [Lomet, col. 16, lines 23-25 see also Lomet, col. 19, lines 45-51 with Lomet, col. 20, lines 20-26].

**Claim 45** encompasses substantially the same scope of the invention as that of Claim 19, in addition to a server and some objects for performing the method steps of

Claim 19. Therefore, Claim 45 is rejected for the same reasons as stated above with respect to Claim 19.

**Claims 51 and 52** encompass substantially the same scope of the invention as that of Claims 1 and 2, respectfully, in addition to a computing device and some means for performing the method steps of Claims 1 and 2, respectfully. Therefore, Claims 51 and 52 are rejected for the same reasons as stated above with respect to Claims 1 and 2, respectfully.

**Claims 53 and 54** encompass substantially the same scope of the invention as that of Claims 12 and 14, respectfully, in addition to a computing device and some means for performing the method steps of Claims 12 and 14, respectfully. Therefore, Claims 53 and 54 are rejected for the same reasons as stated above with respect to Claims 12 and 14, respectfully.

10. Claims 22, 23, 26, 27, 46, 47, 50, 55 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,485,608 (Lomet et al.) in view of U.S. Patent No. 5,434,994 (Shaheen et al.).

For **Claim 22**, Lomet teaches: “A method for logging while updating a data structure via a plurality of data transactions, [Lomet, col. 7, lines 26-34] comprising:

- ...generating a plurality of log entries corresponding to a plurality of data transactions, the data transactions to be carried out on said data structure, wherein the data transactions are associated with a single operation on the data

structure; [Lomet, col. 1, lines 29-48 with Lomet, col. 22, lines 25-30 with Lomet, col. 19, lines 35-37 with Lomet, col. 19, lines 45-51] and

- ...where the single log is partitioned into an upper layer and an allocation layer, [Lomet, col. 5, lines 31-45 with Lomet, Fig. 3] ... wherein the single log includes log entries from both the upper layer and allocation layer [Lomet, col. 5, lines 15-22 with Lomet, Fig. 3]...wherein said entries from said allocation layer are local to its corresponding computing device of a plurality of computing devices [Lomet, col. 2, lines 50-53 with Lomet, col. 5, lines 51-62] and said entries from said upper layer are replicated among said plurality of computing devices; [Lomet, col. 5, lines 51-62 with Lomet, col. 2, lines 11-16]
- associating said plurality of log entries with each other for use in determining whether the single operation on the data structure has been completed; [Lomet, col. 1, lines 29-48 with Lomet, col. 22, lines 25-30 with Lomet, col. 19, lines 35-37 with Lomet, col. 19, lines 45-51] and
- wherein said single log is a partially persistent log, where a tail of said partially persistent log is in a memory, and said partially persistent log comprises of said memory and a persistent storage" [Lomet, col. 4, lines 28-30 with Lomet, col. 4, lines 64-67 with Lomet, col. 5, lines 1-3 with Lomet, col. 12, lines 20-23 with Lomet, col. 7, lines 26-34 with Lomet, col. 19, lines 35-37].

Lomet discloses the above limitations but does not expressly teach:

- "...replicating updates to the data structure to a first server location and a second server location;

- maintaining a single log...at each of said first and second server locations."

With respect to Claim 22, an analogous art, Shaheen, teaches:

- "...replicating updates to the data structure to a first server location and a second server location; [Shaheen, col. 7, lines 50-55]
- maintaining a single log...at each of said first and second server locations"  
[Shaheen, col. 4, lines 62-66].

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Shaheen with Lomet because both inventions are directed towards recovering data upon failure.

Shaheen's invention would have been expected to successfully work well with Lomet's invention because both inventions use computers using logs. Lomet discloses methods and an apparatus for updating information in a computer system using logs and state identifiers comprising Rlogs, Ulogs and Alogs, however Lomet does not expressly disclose replicating data on multiple servers, or maintaining a single log on those servers. Shaheen discloses a system and method for maintaining replicated data coherency in a data processing system comprising replicating data and logs across multiple servers.

It would have been obvious to one of ordinary skill in the art at the time of invention to take the replication of data and logs across multiple servers from Shaheen and install it into the invention of Lomet, thereby offering the obvious advantage of making Lomet distributed to increase the availability and reliability of distributed systems of Lomet (Shaheen, col. 1, lines 36-39).

**Claim 23** can be mapped to Lomet (as modified by Shaheen) as follows: “A method according to claim 22, further including recovering the data structure after a failure by performing parallel recovery operations by each of said first and second server locations” [Shaheen, col. 4, lines 60-66 with Shaheen, col. 7, lines 49-57].

**Claim 26** can be mapped to Lomet (as modified by Shaheen) as follows: “A method according to claim 22, wherein the allocation layer handles at least one of (A) an allocate disk space operation, (B) a deallocate disk space operation, (C) a read from the allocated disk space operation and (D) a write to the allocated disk space operation” [Lomet, col. 5, lines 31-38].

**Claim 27** encompasses substantially the same scope of the invention as that of Claim 22, in addition to computer readable medium and some instructions for performing the method steps of Claim 22. Therefore, Claim 27 is rejected for the same reasons as stated above with respect to Claim 22.

**Claims 46, 47, and 50** encompass substantially the same scope of the invention as that of Claims 22, 23, and 26, respectfully, in addition to a serer and some objects for performing the method steps of Claims 22, 23, and 26, respectfully. Therefore, Claims 46, 47, and 50 are rejected for the same reasons as stated above with respect to Claims 22, 23, and 26, respectfully. Additionally, Claim 46 has an additional limitation not found in Claim 22, but is also taught by Lomet : “wherein a boundary between said memory and said persistent storage in said partially persistent log varies over time” [Lomet, col. 4, lines 28-30 with Lomet, col. 4, lines 64-67 with Lomet, col. 5, lines 1-3

with Lomet, col. 12, lines 20-23 with Lomet, col. 19, lines 35-37 with Lomet, col. 16, lines 23-25 see also Lomet, col. 19, lines 45-51 with Lomet, col. 20, lines 20-26].

**Claims 55 and 56** encompass substantially the same scope of the invention as that of Claims 22 and 23, respectfully, in addition to a computing device and some means for performing the method steps of Claims 22 and 23, respectfully. Therefore, Claims 55 and 56 are rejected for the same reasons as stated above with respect to Claims 22 and 23, respectfully. Additionally, Claim 55 recites “wherein said entries from the upper layer are replicated to both said first server and said second server, while said entries from said allocation layer are stored locally on said first server and said second server” which is taught by [Lomet, col. 2, lines 50-53 with Lomet, col. 5, lines 51-62 with Lomet, col. 2, lines 11-16] (similar to the above claims). Also, Claim 55 recites “wherein said single log is a partially persistent log that has a boundary that changes over time between a persistent and non-persistent memory” which is taught by [Lomet, col. 4, lines 28-30 with Lomet, col. 4, lines 64-67 with Lomet, col. 5, lines 1-3 with Lomet, col. 12, lines 20-23 with Lomet, col. 19, lines 35-37 with Lomet, col. 16, lines 23-25 see also Lomet, col. 19, lines 45-51 with Lomet, col. 20, lines 20-26] (similar to the above claims).

11. Claims 24, 25, 48, and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,485,608 (Lomet et al.) in view of U.S. Patent No. 5,434,994 (Shaheen et al.), further in view of Efficient Locking for Concurrent Operations on B-Trees (Lehman et al.).

For **Claim 24**, Lomet (as modified by Shaheen) teaches: “A method according to claim 22.”

Lomet (as modified by Shaheen) discloses the above limitation but does not expressly teach: “wherein said data structure is a B-link tree.”

With respect to Claim 24, an analogous art, Lehman, teaches: “wherein said data structure is a B-link tree” [Lehman, p. 657, section 3.3].

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Lehman with Lomet (as modified by Shaheen) because both inventions are directed towards storing information in a database.

Lehman’s invention would have been expected to successfully work well with Lomet (as modified by Shaheen)’s invention because both inventions use databases. Lomet (as modified by Shaheen) discloses methods and an apparatus for updating information in a computer system using logs and state identifiers comprising Rlogs, Ulogs and Alogs, however Lomet (as modified by Shaheen) does not expressly disclose the use of a B-link-tree to store the data in the database of Lomet (as modified by Shaheen). Lehman discloses efficient locking for concurrent operations on B-trees comprising a B-link-tree.

It would have been obvious to one of ordinary skill in the art at the time of invention to take the b-link-tree from Lehman and install it into the invention of Lomet (as modified by Shaheen), thereby offering the obvious advantage of a guaranteed small (average) search, insertion, and deletion time for the database of Lomet (as modified by Shaheen).

**Claim 25** can be mapped to Lomet (as modified by Shaheen and Lehman) as follows: “A method according to claim 24, wherein the upper layer is a B-link tree layer that handles B-link tree operations” [Lomet, col. 5, lines 39-44].

**Claims 48 and 49** encompass substantially the same scope of the invention as that of Claims 24 and 25, respectfully, in addition to a server and some objects for performing the method steps of Claims 24 and 25, respectfully. Therefore, Claims 48 and 49 are rejected for the same reasons as stated above with respect to Claims 24 and 25, respectfully.

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

### **Conclusion**

13. Any prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Applicant is advised that, although not used in the rejections above, prior art cited on any PTO-892 form and not relied upon is considered materially relevant to the applicant's claimed invention and/or portions of the claimed invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRENT STACE whose telephone number is (571)272-8372 and fax number is 571-273-8372. The examiner can normally be reached on M-F 9am-5:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Apu M. Mofiz can be reached on 571-272-4080. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Etienne P LeRoux/  
Primary Examiner, Art Unit 2161

/B. S./  
Examiner, Art Unit 2161